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ERRATA NOTICE

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Title: Release A EDC DAAC Design Specification for the ECS Project

The following change pages have been incorporated into the subject document (attached):

3-3 (Figure 3.1.1-2)

3-8 (Internetworking Subsystem)

3-17 (Figure 3.4.2-1)

If you have any questions, please contact our Data Management Office at (301) 925-0322.

305-CD-017-001

EOSDIS Core System Project

Release A EDC DAAC Design Specification for the ECS Project

July 1995

Hughes Information Technology Corporation
Landover, Maryland

305-CD-017-001

Release A EDC DAAC Design Specification for the ECS Project

July 1995

Prepared Under Contract NAS5-60000
CDRL Item 046

APPROVED BY

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Preface

This document is one of sixteen comprising the detailed design specifications of the SDPS and CSMS subsystem for Release A of the ECS project. A complete list of the design specification documents is given below. Of particular interest are documents number 305-CD-004, which provides an overview of the subsystems and 305-CD-018, the Data Dictionary, for those reviewing the object models in detail. A Release A SDPS and CSMS CDR Review Guide (510-TP-002) is also available.

The SDPS and CSMS subsystem design specification documents for Release A of the ECS Project include:

305-CD-004	Release A Overview of the SDPS and CSMS Segment System Design Specification
305-CD-005	Release A SDPS Client Subsystem Design Specification
305-CD-006	Release A SDPS Interoperability Subsystem Design Specification
305-CD-007	Release A SDPS Data Management Subsystem Design Specification
305-CD-008	Release A SDPS Data Server Subsystem Design Specification
305-CD-009	Release A SDPS Ingest Subsystem Design Specification
305-CD-010	Release A SDPS Planning Subsystem Design Specification
305-CD-011	Release A SDPS Data Processing Subsystem Design Specification
305-CD-012	Release A CSMS Segment Communications Subsystem Design Specification
305-CD-013	Release A CSMS Segment Systems Management Subsystem Design Specification
305-CD-014	Release A GSFC Distributed Active Archive Center Design Specification
305-CD-015	Release A LaRC Distributed Active Archive Center Design Specification
305-CD-016	Release A MSFC Distributed Active Archive Center Design Specification
305-CD-017	Release A EROS Data Center Distributed Active Archive Center Design Specification
305-CD-018	Release A Data Dictionary for Subsystem Design Specification
305-CD-019	Release A System Monitoring and Coordination Center Design Specification

This document is a contract deliverable with an approval code 2. As such, it does not require formal Government approval, however, the Government reserves the right to request changes within 45 days of the initial submittal. Once approved, contractor changes to this document are

handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision.

Any questions should be addressed to:

Data Management Office
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Abstract

The Release A Goddard Space Flight Center (EDC) Distributed Active Archive Center (DAAC) Design Specification describes the ECS subsystems at the EDC DAAC. The ECS Subsystem-Specific Design Specifications provide detailed design descriptions of the subsystems. This document shows the specific incorporation of that design at the EDC DAAC, including the identification of the specific software, hardware and network configuration for the DAAC.

Keywords: EDC, DAAC, EDC DAAC, DAAC Configuration, DAAC design

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Abbreviations and Acronyms

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1. Introduction

1.1 Identification

This Release A EDC DAAC Implementation/Design Specification for the ECS Project, Contract Data Requirement List (CDRL) Item 046, with requirements specified in Data Item Description (DID) 305/DV2, is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS), Contract NAS5-60000.

1.2 Scope

Release A of ECS supports the early operational stages of the Tropical Rainfall Measuring Mission (TRMM) and low level testing of ECS external interfaces. The TRMM Release follows an earlier ECS delivery, referred to as Interim Release 1 (Ir1), which provided certain enterprise infrastructure in preparation for down stream deliveries. The infrastructure delivery of ECS, involves four Distributed Active Archive Centers, these being the Goddard Space Flight Center (GSFC), the Marshall Space Flight Center (MSFC), the Langley Research Center (LaRC), and the EROS Data Center (EDC). Even though, only three of the DAACs (GSFC, MSFC and LaRC) directly support the TRMM effort all four are updated to the TRMM level at Release A to simplify configuration management and to allow for interface testing for future ECS releases. For Release A, the Ir1 configurations of GSFC, MSFC and LaRC are updated with major hardware and software deliveries while EDC, which is not part of TRMM operations, receives a minor update to support interface testing.

This document is one of a series of documents comprising the Science and Communications Development Office (SCDO) design specification for the Communications and System Management Segment (CSMS) and the Science and Data Processing Segment (SDPS) for Release A. The series of documents include an overview, a design specification document for each subsystem, and a design specification document for each DAAC involved in the release, as well as one for the System Monitoring and Control (SMC) center.

This document specifically focuses on the EDC DAAC's ECS configuration and capabilities at Release A. It is released in, and reviewed at the formal Release A Critical Design Review. Consistent with the associated ECS subsystem-specific design specifications, this document reflects the Technical Baseline submitted via contract correspondence number ECS 194-00343.

This document reflects the June 21, 1995 Technical Baseline maintained by the contractor configuration control board in accordance with ECS Technical Direction No. 11, dated December 6, 1994.

1.3 Purpose

The Release A EDC Design Specification establishes the EDC DAAC's ECS configuration and capabilities at Release A. These capabilities are selected from two ECS design segments referred to

as the Science Data Processing Segment (SDPS) and the Communications and Systems Management Segment (CSMS). More specifically this document will address how the EDC Release A version of ECS will provide the hardware, software, and operations to:

- test message passing to receive science data (Landsat-7);
- test message passing to receive ancillary data required by algorithms;
- test message passing to receive science algorithms, and
- test EDC's facilities to integrate science software for execution on product generation systems.

Likewise, this document will address how the EDC Release A version of CSMS will provide the hardware, software, and operations to:

- provide EOSDIS Science Network (ESN) links among the Release A Distributed Active Archive Centers (DAACs) and Goddard Space Flight Center (GSFC) mission operations and monitoring centers to support exchange of mission-related data;
- provide an ESN backbone for the DAAC's internal LAN, and
- support status/configuration information exchange for resource monitoring test efforts.

The purpose of this document is to show the elements of the Release A ECS science data processing and communications design and implementation that will support the EDC DAAC in meeting its objectives. The Release A Overview of SDPS and CSMS (305-CD-004-001) provides an overview of the ECS subsystems and should be used by the reader in order to get a basic understanding of ECS design components. The Release Plan Content Description document (222-TP-003-005) provides a detailed mapping of functional capabilities and services that will be available for each release.

The EDC DAAC includes all of the ECS Release A communications subsystems but, because EDC does not support the TRMM Mission, EDC has only the Release A SDPS subsystems needed to do basic science software integration and testing and enough of the ingest subsystem to do message passing for Landsat-7 interface testing.

1.4 Status and Schedule

This submittal of DID 305/DV2 meets the milestone specified in the Contract Data Requirements List (CDRL) for Critical Design Review (pre-CDR) of NASA Contract NAS5-60000. The submittal will be reviewed during the Release A (CDR) and changes to the design which resulted from that review will be reflected in subsequent updates. The CDR may trigger follow up actions in response to Review Item Discrepancies (RID) the results of which will be incorporated into the Test Readiness Review (TRR) version of this document.

1.5 Document Organization

This document is organized to describe the design of ECS at the EDC DAAC as follows:

Section 1 provides information regarding the identification, scope, purpose, status and schedule, and organization of this document.

Section 2 provides a listing of the related documents which were used as source information for this document.

Section 3 provides a description of the ECS design at the EDC DAAC. It includes a description of the DAAC external interfaces, ECS software components, including identification of commercial off the shelf (COTS) products, hardware configuration and operational activities.

- Subsection 3.1 establishes the context for the technical discussions with an overview of the specific EDC mission and EDC Release A operations. It identifies the key ECS related mission and operations activities that are supported via the ECS functionality at the DAAC.
- Subsection 3.2 addresses the external interfaces of the ECS subsystems as implemented at EDC DAAC. Major interfaces include those with the Scientific Computing Facility and Landsat 7.
- Subsection 3.3 provides a software component analysis. There are 10 ECS data processing and communications subsystems that contain Hardware Configuration Items (HWCI) and, Computer Software Configuration Items (CSCI). This section addresses the CSCI and their corresponding lower level Computer Software Components (CSC). The CSCs are described in detail in their respective subsystem design specification documents. In this section, the CSCs are captured in a single table, broken down by Subsystem/CSCI. The table lists the CSCI and the associated CSCs. Notes are provided to expand upon generic explanations from the body of the Subsystem Design Specifications to describe what makes the particular CSC specific to the DAAC. In addition, when a CSC is identified as Off-the-shelf (OTS), the candidate product is identified.
- Subsection 3.4 provides a DAAC specific discussion of the ECS data processing and communications Hardware Configuration Items (HWCI). This section identifies the HWCI components and indicates the specific components and quantities that are resident at the DAAC. It includes the Local area network (LAN) configuration and the rationale for the specific hardware configuration.
- Subsection 3.5 provides a software to hardware configuration mapping.

Section 4 gives a description of what can be expected in the next version of this document which is planned for each subsequent Release of ECS.

The section, Abbreviations and Acronyms, contains an alphabetized list of the definitions for abbreviations and acronyms used in this document.

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2. Related Documentation

2.1 Parent Documents

The parent documents are the documents from which the scope and content of this Release A EDC DAAC Implementation/Design Specification is derived.

194-207-SE1-001	System Design Specification for the ECS Project
305-CD-002-002	Science Data Processing Segment (SDPS) Design Specification for the ECS Project
305-CD-003-002	Communications and System Management Segment (CSMS) Design Specification for the ECS Project
305-CD-004-001	Release A Overview of the SDPS and CSMS System Design Specification for the ECS Project
305-CD-005-001	Release A SDPS Client Subsystem Design Specification for the ECS Project
305-CD-006-001	Release A SDPS Interoperability Subsystem Design Specification for the ECS Project
305-CD-007-001	Release A SDPS Data Management Subsystem Design Specification for the ECS Project
305-CD-008-001	Release A SDPS Data Server Subsystem Design Specification for the ECS Project
305-CD-009-001	Release A SDPS Ingest Subsystem Design Specification for the ECS Project
305-CD-010-001	Release A SDPS Planning Subsystem Design Specification for the ECS Project
305-CD-011-001	Release A SDPS Data Processing Subsystem Design Specification for the ECS Project
305-CD-012-001	Release A CSMS Communications Subsystem Design Specification for the ECS Project
305-CD-013-001	Release A CSMS Systems Management Subsystem Design Specification for the ECS Project
305-CD-018-001	Release A Data Dictionary for Subsystem Design Specification for the ECS Project

2.2 Applicable Documents

The following documents are referenced within this Specification, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this volume.

206-CD-001-002	Version 0 Analysis Report for the ECS Project
209-CD-001-001	Interface Control Document Between EOSDIS Core System (ECS) and the NASA Science Internet
209-CD-002-001	Interface Control Document Between EOSDIS Core System (ECS) and ASTER Ground Data System
209-CD-003-001	Interface Control Document Between EOSDIS Core System (ECS) and EOS-AM Project for AM-1 Spacecraft Analysis Software
209-CD-004-001	Data Format Control Document for the Earth Observing System (EOS) AM-1 Project Data Base
209-CD-005-001	Interface Control Document Between EOSDIS Core System (ECS) and Science Computing Facilities (SCF)
209-CD-011-001	Interface Control Document Between EOSDIS Core System (ECS) and the Version 0 System
305-CD-014-001	Release A GSFC DAAC Design Specification for the ECS Project
305-CD-015-001	Release A LaRC DAAC Design Specification for the ECS Project
305-CD-016-001	Release A MSFC DAAC Design Specification for the ECS Project
305-CD-019-001	Release A System Monitoring and Coordination Center Design Specification for the ECS Project
313-CD-004-001	Release A CSMS/SDPS Internal Interface Control Document for the ECS Project
604-CD-001-004	Operations Concept for the ECS Project: Part 1-- ECS Overview
604-CD-003-001	Operations Concept for the ECS Project: Part 2A -- ECS Release A
605-CD-001-001	Release A Operations Scenarios for the ECS Project
210-TP-001-003	Technical Baseline for ECS Project
222-TP-003-006	Release Plan Content Description for the ECS Project
423-41-03	Goddard Space Flight Center, EOSDIS Core System (ECS) Contract Data Requirements Document

2.3 Information Documents Not Referenced

The following documents, although not referenced herein and/or not directly applicable, do amplify and clarify the information presented in this document. These documents are not binding on the content of the DAAC Implementation/Design Specification.

205-CD-002-001	Science User's Guide and Operations Procedure Handbook for the ECS Project. Part 4: Software Developer's Guide to Preparation, Delivery, Integration, and Test with ECS
333-CD-002-003	SDP Toolkit Users Guide for the ECS Project
194-302-DV2-001	ECS Facilities Plan for the ECS Project
101-303-DV1-001	Individual Facility Requirements for the ECS Project, Preliminary
601-CD-001-004	Maintenance and Operations Management Plan for the ECS Project
608-CD-001-002	ECS Operations Plan for Release B of the ECS Project
101-620-OP2-001	List of Recommended Maintenance Equipment for the ECS Project
193-801-SD4-001	PGS Toolkit Requirements Specification for the ECS Project
828-RD-001-002	Government Furnished Property for the ECS Project
222-TP-003-005	Release Plan Content Description for the ECS Project
430-TP-001-001	SDP Toolkit Implementation with Pathfinder SSM/I Precipitation Rate Algorithm, Technical Paper
440-TP-001-001	Science Data Server Architecture Study [for the ECS Project]
420-TD-001-001	ECS Data Server Taxonomy Technical Description [for the ECS Project]
423-16-01	Goddard Space Flight Center, Data Production Software and Science Computing Facility (SCF) Standards and Guidelines
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System
540-022	Goddard Space Flight Center, Earth Observing System (EOS) Communications (Ecom) System Design Specification
560-EDOS-0211.0001	Goddard Space Flight Center, Interface Requirements Document Between EDOS and the EOS Ground System (EGS)

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3. EDC DAAC Configuration

3.1 Introduction

3.1.1 EDC DAAC Overview

The EDC Distributed Active Archive Center (EDC DAAC) is one of the nine DAACs that are part of NASA's Earth Observing System Data and Information System (EOSDIS). These DAACs are generally organized to support specific scientific disciplines. The objective of the EDC DAAC is to archive science data and provide support services to its users in the discipline areas of land science. EDCs principle responsibilities as a DAAC include supporting global change research on conditions and processes existing and operating at or near the land surface, especially as they relate to biology, geology, hydrology, limnology, and ecology and supporting studies of conditions and processes affecting land-atmosphere and land-ocean interactions, and attempts to model the role and influence of these process and interactions in the history and evolution of the total Earth system.

In the pre-EOS time frame, the EDC V0 DAAC has been developed, and is still being developed, to enhance and improve scientific research and productivity by consolidating access to remote sensor earth science data, as well as by providing services that provide added value to the data stored at the DAAC and help people realize the scientific and educational potential of regional and global land data stored at the DAAC dating back to 1972.

In preparation for Release A, an early release of ECS (Interim Release 1) will be made available to support early interface testing. The Ir1 equipment and software suites will be augmented in Release A which, for EDC, is provided to support Landsat-7 early interface testing, EOS AM-1 interface testing, algorithm I&T, basic data flow and simulation readiness testing. The Release Content Plan provides a description of the missions and the driving requirements which must be satisfied to support these missions. In order to support the EOSDIS ongoing missions, operation of the DAAC's Version 0 system is not interrupted during the test and integration activities occurring at EDC during this release.

Figures 3.1.1-1 and 3.1.1-2 illustrate the SDPS and CSMS subsystems and their components. The bulk of this document focuses on the selected elements of the ECS design that are use to achieve Release A objectives at the DAAC. Section 2.1 of this document identifies CDR Design Specifications which provide detailed information on each subsystem.

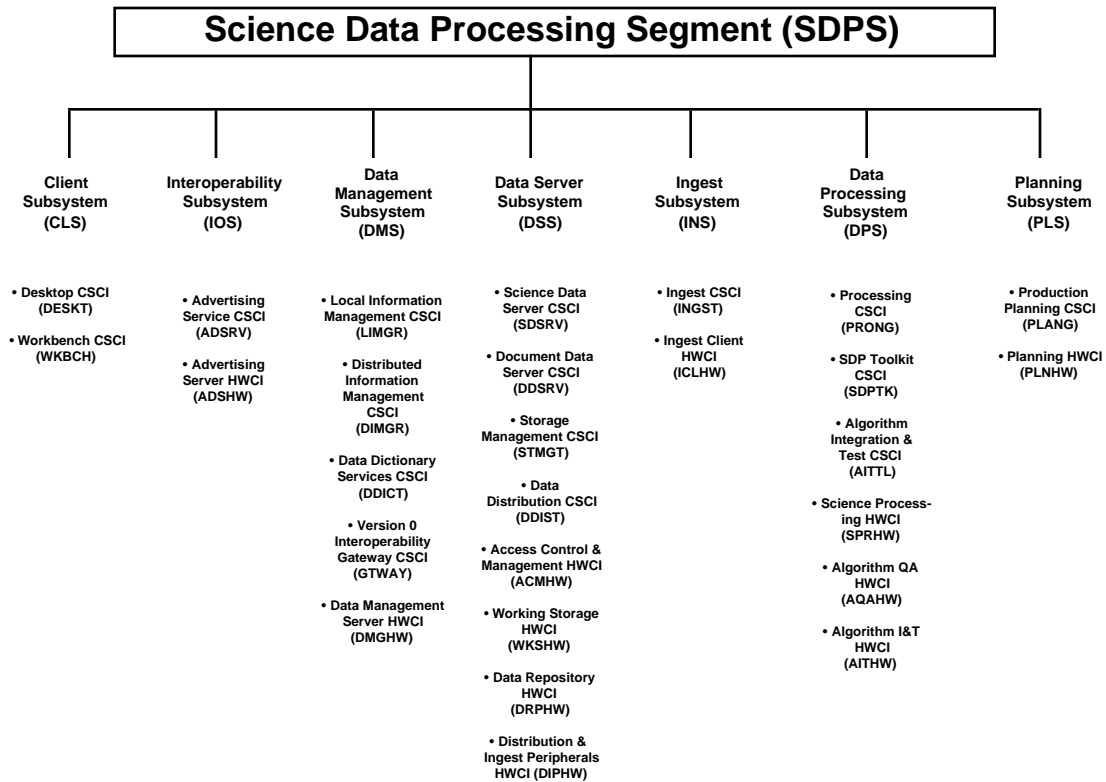


Figure 3.1.1-1. SDPS Subsystems and Components

3.1.2 DAAC-Specific Mission and Operations Activities

ECS subsystems provide mission and operations functionality for Release A at LaRC, GSFC, and MSFC. There are no ECS TRMM operations at EDC, however, during Release A time-frame, EDC will continue to have ECS technical support available during Ir1. Key EDC operations during this time-frame are directly related to interface test support and science software integration and test. Specific ECS functionality provided to support these activities at the EDC ECS DAAC include:

- Hardware and software components to provide capabilities to exchange messages and transfer Landsat-7 data. Message validation and limited data checking is supported. Temporary storage of messages and data is provided to validate interface testing is also provided for the ingest of data from Landsat-7.
- Science software integration and test to include support to integrate Version 1 science software for EOS-AM-1 instruments (ASTER and MODIS) into the DAAC. SDPS components to support science software integration and test are provided by the Data Processing Subsystem. Data Processing hardware and software components provide the capabilities to validate that the science software operates in the DAAC environment including standards checking, integration with the SDP Toolkit, and execution on the DAAC processing resources.

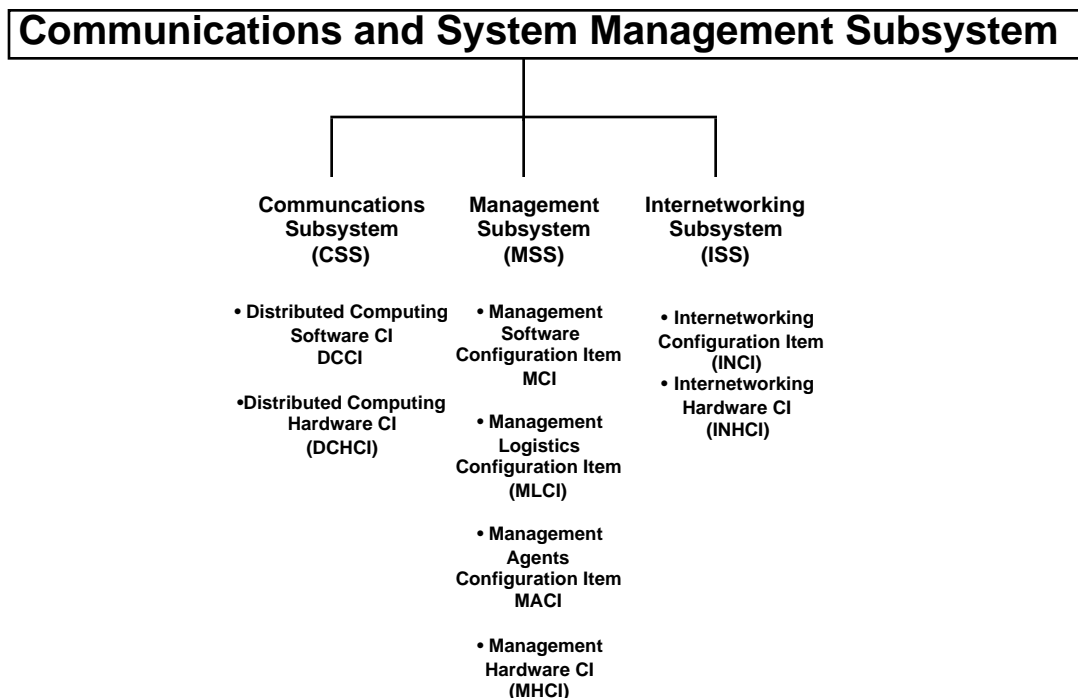


Figure 3.1.1-2. CSMS Subsystems and Components

3.2 EDC External Interfaces

The EDC ECS DAAC will interface with multiple entities external to the DAAC. The ECS subsystem-specific DID305 design documents address the interfaces generically in a series of tables supported by textual explanations. For details, the reader is referred to those documents in addition to the various Interface Control Documents (ICDs). Figure 3.2-1 schematically illustrates the interfaces between the ECS subsystems at the EDC DAAC and its external entities (sinks and sources of data). The figure enumerates data flows which are elaborated upon in table 3.2-1.

The following further describes the external entities, including those identified to support interface testing:

- **Landsat-7**—This interface supports early Landsat-7 interface testing. Potentially, metadata, status, quality control products, calibration data, correlative data, and documentation are examples of things that cross this interface. During the Release A time frame, this interface will be used to support interface testing. This is a manual interface which uses limited ingest functionality provided to EDC at Release A.

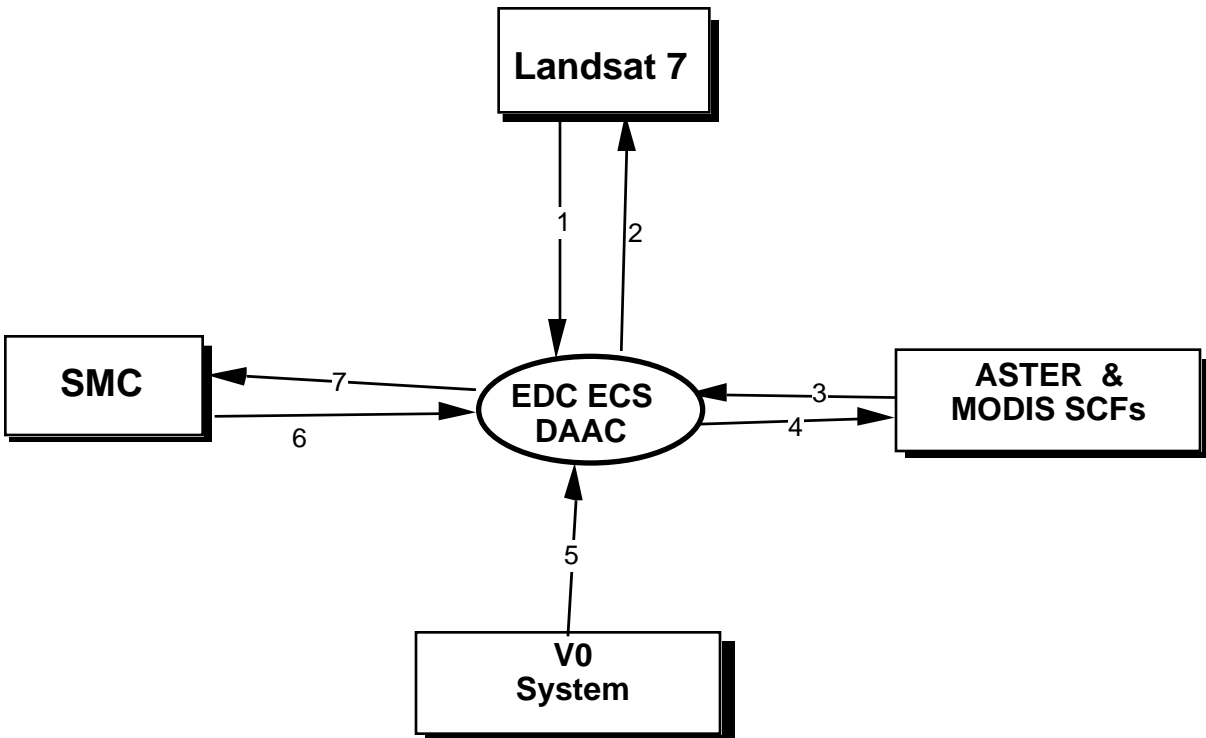


Figure 3.2-1. EDC ECS DAAC External Interfaces

- **ASTER and MODIS SCF**—This interface supports the ASTER and MODIS Instrument Teams. Potentially, algorithms, metadata, status, quality control products, standard products, calibration data, correlative data, algorithm updates and documentation are examples of things that cross this interface. During the Release A time frame, this interface will be used to support interface testing and science software test and integration activities. This is a manual interface which does not invoke the limited ingest function provided to EDC at Release A; SCF personnel are able to remotely log on to equipment and/or use FTP to deliver/receive data from the DAAC. Note: as part of an SCF-like interface the ASTER GDS will send science software (via media) to the DAAC for storage.
- **Version 0 System**—This interface to EDC ECS DAAC supports access to the V0 holdings. It is used to support the interoperability required for cross-DAAC access.
- **SMC**—This interface provides the capability for the EDC DAAC to receive performance information, processing status, scheduling and policy data and user registration information. Policy data includes that established by the ESDIS project. The GSFC DAAC sends it system performance and status reports to SMC as part of this interface.

Table 3.2-1. EDC External Interfaces (1 of 2)

Flow No.	Source	Destination	Data Types	Data Volume	Frequency
1	Landsat 7	Ingest	Metadata	low	several times a day
1	Landsat 7	Ingest	L0 Science Data	~140 GB/day	several times a day
1	Landsat 7	Ingest	Activity Calendar	medium	TBR
1	Landsat 7	Ingest	Payload Correction Data	medium	several times a day
1	Landsat 7	Ingest	Mirror Scan Correction Data	medium	several times a day
1	Landsat 7	Ingest	Calibration data	medium	several times a day
1	Landsat 7	Ingest	Browse Data	high	as required
1	Landsat 7	Ingest	Directory and Guide Information	medium	TBR
2	CSS	Landsat 7	Data acknowledgment	low	as required
3	SCF	Ingest	Status	low	as required
3	SCF	Ingest	Metadata/updates	low	as required
3	SCF	Ingest	Documents	low	as required
3	SCF	Ingest	Algorithms/Updates	medium	as required (includes GDS delivery via Media for storage only)
3	SCF	CSS (DAAC ops via email)	Test Reviews by SCF		as required
3	SCF	CSS (DAAC ops via email)	Request for Resource Usage		as required
4	CSS (DAAC ops via email, kftp)	SCF	Toolkit Delivery and Update Package		as required
4	CSS (DAAC ops via email, kftp)	SCF	Test Results, QA, and Production History Data		as required
4	CSS (DAAC ops via email, kftp)	SCF	Resource Usage		as required
4	CSS (DAAC ops via email, kftp)	SCF	Status		as required
5	V0 System	Ingest	Ancillary data	low	as required
6	SMC	MSS	Policies	low	as required
6	SMC	MSS	Conflict Resolution	low	as required

Table 3.2-1. EDC External Interfaces (2 of 2)

Flow No.	Source	Destination	Data Types	Data Volume	Frequency
6	SMC	MSS	Procedures	low	as required
6	SMC	MSS	Directives	low	as required
7	MSS	SMC	Conflict Resolution Request	low	as required
7	MSS	SMC	Status	low	as required
7	MSS	SMC	Performance	low	as required

Note: Interfaces identified are included for test purposes only.

3.3 Computer Software Component Analysis

3.3.1 Software Subsystem Overview

The 10 ECS software subsystems are described in detail in the ECS Subsystem-specific DID305 documents. This section provides a brief overview description of each of the subsystems.

- **Client Subsystem (CLS)**—This software consists of graphic user interface (GUI) programs, tools for viewing and/or manipulating the various kinds of ECS data (e.g., images, documents, tables) and libraries representing the client application program interface (API) of ECS services. For Release A, the client subsystem will consist of the desktop, an advertising user interface, and a data visualization tool (EOSView). The remainder of the Release A user interface will be provided by an enhanced version of the V0 System Client. The client subsystem components will be available to users for installation on their workstations and will also be deployed on workstations within the DAAC in support of normal operations, including User Services support.
- **Interoperability Subsystem (IOS)**—This subsystem provides and maintains a database of information about the services and data offered by ECS, and allows users to search through this database to locate services and data that may be of interest to them. It provides an advertising service that will be implemented as an SDPS developed distributed database application on top of a commercial off-the-shelf Data Base Management System (DBMS). The user interface to this subsystem is the Client subsystem.
- **Data Management Subsystem (DMS)**—This subsystem includes functions which provide uniform access to descriptions of the data and the data elements offered by the EOSDIS repositories and provide a bidirectional gateway between ECS and Version 0. This subsystem also includes distributed search and retrieval functions and corresponding site interfaces, however, they are not part of the Release A design.
- **Data Server Subsystem (DSS)**—The subsystem provides the physical storage access and management functions for the ECS earth science data repositories. Other subsystems can access it directly or via the data management subsystem (if they need assistance with searches across several of these repositories). The subsystem also includes the capabilities needed to distribute bulk data via electronic file transfer or physical media. Other components include, for example, administrative software to manage the subsystem

resources and perform data administration functions (e.g., to maintain the database schema); and data distribution software, e.g., for media handling and format conversions. The main components of the subsystem are the following:

- database management system—SDPS will use an off-the-shelf DBMS (SYBASE) to manage its earth science data and implement spatial searching, as well as for the more traditional types of data (e.g., system administrative and operational data). It will use a document management system to provide storage and information retrieval for guide documents, scientific articles, and other types of document data.
 - file storage management systems—they are used to provide archival and staging storage for large volumes of data. SDPS is considering the use of several hardware/software configurations which are either off-the-shelf or a mixture of off-the-shelf and developed software.
 - data type libraries—they will implement functionality of earth science and related data that is unique and not available off the shelf (e.g., spatial search algorithms and translations among coordinate systems). The libraries will interface with the data storage facilities, i.e., the database and file storage management systems.
- **Ingest Subsystem (INS)**—The subsystem deals with the initial reception of all data received at an EOSDIS facility and triggers subsequent archiving and processing of the data. Given the variety of possible data formats and structures, each external interface, and each ad-hoc ingest task may have unique aspects. Therefore, the ingest subsystem is organized into a collection of software components (e.g., ingest management software, translation tools, media handling software) from which those required in a specific situation can be readily configured. The resultant configuration is called an ingest client. Ingest clients can operate on a continuous basis to serve a routine external interface; or they may exist only for the duration of a specific ad-hoc ingest task.
 - **Data Processing Subsystem (DPS)**—The main components of the data processing subsystem—the science algorithms—will be provided by the science teams. The data processing subsystem will provide the necessary hardware resources, as well as software for queuing, dispatching and managing the execution of these algorithms in an environment which eventually will be highly distributed and consist of heterogeneous computing platforms. The DPS also interacts with the DSS to cause the staging and de-staging of data resources in synchronization with processing requirements.
 - **Planning Subsystem (PLS)**—This subsystem provides the functions needed to pre-plan routine data processing, schedule ad-hoc processing, and dispatch and manage processing requests. The subsystem provides access to the data production schedules at each site, and provides management functions for handling deviations from the schedule to operations and science users.
 - **Management Subsystem (MSS)**—The Management Subsystem (MSS) provides enterprise management (network and system management) for all ECS resources: commercial hardware (including computers, peripherals, and network routing devices), commercial software, and custom applications. Enterprise management reduces overall development and equipment costs, improves operational robustness, and promotes

compatibility with evolving industry and government standards. Consistent with current trends in industry, the MSS thus manages both ECS's network resources per ESN requirements and ECS's host/application resources per SMC requirements. Additionally MSS also supports many requirements allocated to SDPS and FOS for management data collection and analysis/distribution.

The MSS allocates services to both the system-wide and local levels. With few exceptions, the management services will be fully decentralized, no single point of failure exists which would preclude user access. In principle every service is distributed unless there is an overriding reason for it to be centralized. MSS has two key specializations: Enterprise Monitor and Coordination Services and Local System Management Services.

For Ir1 and Release A not all of the MSS services will be fully implemented, some will be provided through COTS and COTS customization, while others will be provided through the use of Office Automation (OA) tools.

- **Communications Subsystem (CSS)**—The CSS services include Object Services, Distributed Object Framework (DOF) and Common Facility Services. Support in this subsystem area is provided for peer-to-peer, advanced distributed, messaging, management, and event-handling communications facilities. These services typically appear on communicating end-systems across an internetwork and are not layered, but hierarchical in nature. Additionally, services to support communicating entities are provided, included directory, security, time, and other ancillary services. The services of the Communications Subsystem are functionally dependent on the services of the Internetworking Subsystem. The services of the common facility, object and DOF are the fundamental set of interfaces for all CSMS management and FOS and SDPS user access (i.e., pull) domain services. The DOF services are the fundamental set of dependencies of the common facility and object services.
- **Internetworking Subsystem (ISS):** The Internetworking Subsystem provides for the transfer of data transparently within the DAACs, SMC and EOC, and for providing interfaces between these components and external networks. ECS interfaces with external systems and DAAC to DAAC communications are provided by the EOSDIS Backbone Network (EBnet). EBnet's primary function is to transfer data between DAACs, including both product data and inter-DAAC queries and metadata responses. Other networks, such as NSI, will provide wide-area services to ECS. In addition, "Campus" networks, which form the existing networking infrastructure at the ECS locations, will provide connectivity to EOSDIS components such as SCFs and ISTs.

3.3.2 Software Subsystem Analysis Summary

The following describes aspects of the software subsystems that are unique to the EDC ECS-DAAC for Release A.

- **Client Subsystem**—The client software will have no EDC DAAC specific portions. This software supports the EDC ECS DAAC M&O staff (e.g., operations, user services, system administrators) and will be hosted on ECS workstations defined within the system. The Client software may be hosted on existing DAAC workstations to provide additional

user access, but the EDC DAAC will be responsible for providing additional Client host workstations when required by the DAAC's user community.

- **Data Server**—This Subsystem is not part of the EDC Release A delivery.
- **Data Management**—None of the data management software will be specific to the EDC DAAC. In Release A, neither the LIMGR or the DIMGR will be provided. Only the functionality of the Data Dictionary and Gateway CSCIs are provided. The V0 Gateway (GTWAY) CSCI will interface with the data servers at each site. Local and cross-DAAC searches are provided via capabilities resulting from integrating the components from the V0 System IMS into ECS.
- **Ingest**—The software portions for ingest at EDC may differ from those of other DAACs because of dataset dependencies. At EDC, Release A software will be provided to support the front end testing of the Landsat-7 PS interface.
- **Interoperability**—This Subsystem is not part of the EDC Release A delivery.
- **Production Planning**—This Subsystem is not part of the EDC Release A delivery.
- **Data Processing**—Due to dataset characteristics there will be some software unique to EDC in the area of Science Data Processing (e.g., compilers for the Science software) and Pre-processing (e.g., DAAC-specific external interface EDOS). However, the Release A capabilities at the EDC DAAC are available only as a function of supporting the integration and test of ASTER and MODIS algorithms.
- **Systems Management**—This subsystem is composed of a variety of management applications, providing services such as fault, performance, security and accountability management for ECS networks, hosts, and applications. Two tiers of “view” (domain of management service interface) provided by the applications in this subsystem. Only the local management view is provided at the EDC DAAC.
- **Communications Subsystem**—This subsystem will not have any EDC DAAC specific portions.
- **Internetworking Subsystem**—This subsystem will not have any EDC DAAC specific portions.

Table 3.3-1 lists the ECS subsystems and associated CSCIs and CSCs. For each CSC, there is an indication of the type of component. As defined in the DID 305 subsystem-specific documents, type indicates whether the component is custom developed (DEV), off the shelf (OTS), a CSC reused from another subsystem (reuse), a wrapper (WRP), or a combination of these types. The Use column indicates whether a generic (Gnrc) form of the CSC is implemented or specific (Spf) tailoring or use is required at a DAAC. The Notes column is included to comment about the characteristics of the system, data, and/or software that makes the CSC specific, as well as to provide any additional information about the generic CSCs. This column also identifies the OTS product.

Table 3.3.2-1. EDC Components Analysis (1 of 5)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
Client	DESKT	Desktop	DEV	Gnrc	
Client	WKBCH	Hypertext Viewer CSC	OTS	Gnrc	Netscape
Client	WKBCH	Data Visualization (EOSView) CSC	DEV	Gnrc	
Client	WKBCH	SDPS Toolkit CSC	DEV	Gnrc	
Client	WKBCH	CSMS Toolkit CSC	DEV	Gnrc	
Client	WKBCH	Release A Client	OTS	Gnrc	enhanced V0 client
CSS	DCCI	File Access Services	OTS/ DEV	Gnrc	native operating system (ftp)
CSS	DCCI	Message Passing Services	DEV	Gnrc	Developed with OODCE
CSS	DCCI	Time Services	OTS/ DEV	Gnrc	OODCE
CSS	DCCI	Event Logger Services	DEV	Gnrc	
CSS	DCCI	Electronic Mail Services	OTS/ DEV	Gnrc	native operating system
CSS	DCCI	Thread Services	OTS	Gnrc	OODCE
CSS	DCCI	Directory/Naming Services	OTS/ DEV	Gnrc	OODCE
CSS	DCCI	Life Cycle Services	OTS/ DEV	Gnrc	OODCE
CSS	DCCI	Security Services	OTS/ DEV	Gnrc	OODCE
CSS	DCCI	DOF Services	OTS	Gnrc	OODCE
CSS	DCCI	Virtual Terminal Services	OTS	Gnrc	native operating system
Data Processing	AITTL	Documentation Viewing Tools	OTS	Gnrc	SoftWindows/MS Office Ghostview
Data Processing	AITTL	Standards Checkers	OTS/ DEV	Spf	FORCHECK for Fortran 77; otherwise, native compilers
Data Processing	AITTL	Code Analysis Tools	OTS	Spf	CASEVision SPARCWorks
Data Processing	AITTL	Data Visualization Tools	OTS	Gnrc	IDL
Data Processing	AITTL	ECS HDF Visualization Tools	DEV	Gnrc	CSC reused from WKBCH CSCI - EOSView
Data Processing	AITTL	HDF File Comparison Utility	DEV	Gnrc	Custom IDL program
Data Processing	AITTL	Binary File Comparison Utility	DEV	Gnrc	
Data Processing	AITTL	Profiling Tools	OTS	Spf	CASEVision

Table 3.3.2-1. EDC Components Analysis (2 of 5)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
Data Processing	AITTL	PGE Processing GUI	DEV	Gnrc	
Data Processing	AITTL	PGE Registration GUI	DEV	Gnrc	
Data Processing	AITTL	Report Generation Tools	OTS/ DEV	Gnrc	OTS: SoftWindows/MS Office, DEV: AI&T manager
Data Processing	AITTL	SDP Toolkit-related Tools	DEV	Gnrc	
Data Processing	AITTL	Product Metadata Display Tool	DEV	Gnrc	reused from HDF File Comparison Utility CSC
Data Processing	PRONG	Resource Management	DEV	Gnrc	
Data Processing	PRONG	COTS	OTS	Gnrc	AutoSys and AutoXpert
Data Processing	PRONG	COTS Management	DEV	Gnrc	
Data Processing	PRONG	Data Management	DEV	Gnrc	
Data Processing	PRONG	Data Pre-Processing	DEV	Spf	Based on uniqueness of ancillary data products
Data Processing	PRONG	PGE Execution Management	DEV	Gnrc	
Data Processing	PRONG	Quality Assurance Monitor	DEV	Spf	
Data Processing	SDPTK	Ancillary Data Access	DEV	Gnrc	
Data Processing	SDPTK	Celestial Body Position	DEV	Gnrc	
Data Processing	SDPTK	Coordinate System Conversion	DEV	Gnrc	
Data Processing	SDPTK	Constant and Unit Conversions	DEV	Gnrc	
Data Processing	SDPTK	Ephemeris Data Access	DEV	Gnrc	
Data Processing	SDPTK	Geo Coordinate Transformation	DEV	Gnrc	
Data Processing	SDPTK	Input/Output	DEV	Gnrc	
Data Processing	SDPTK	Memory Management	DEV	Gnrc	
Data Processing	SDPTK	Metadata Access	DEV	Gnrc	

Table 3.3.2-1. EDC Components Analysis (3 of 5)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
Data Processing	SDPTK	Process Control	DEV	Gnrc	
Data Processing	SDPTK	Status Message File (Error/Status)	DEV	Gnrc	
Data Processing	SDPTK	Time Date Conversion	DEV	Gnrc	
Data Processing	SDPTK	Math Package	OTS	Gnrc	IMSL
Data Processing	SDPTK	Graphics Library	OTS	Gnrc	IDL
Data Processing	SDPTK	EOS-HDF	DEV	Gnrc	
Ingest	INGST	Ingest Session Manager	DEV	Gnrc	
Ingest	INGST	Polling Ingest Client Interface	DEV	Gnrc	
Ingest	INGST	Ingest Request Processing	DEV	Gnrc	
Ingest	INGST	Ingest Data Transfer	DEV	Gnrc	
Ingest	INGST	Operator Ingest Interface	DEV	Gnrc	
Ingest	INGST	User Network Ingest Interface	DEV	Gnrc	
Ingest	INGST	Ingest DBMS	OTS	Gnrc	Sybase DBMS
Ingest	INGST	Ingest Administration Data	DEV	Gnrc	
Ingest	INGST	Peripheral Software	Reuse	Gnrc	CSC reused from DDIST CSCI
Ingest	INGST	Viewing Tools	Reuse	Gnrc	CSC reused from WKBCH CSCI - EOSView
Ingest	INGST	Client Services	Reuse	Gnrc	
ISS	INCI	Datalink/Physical	OTS	Gnrc	firmware, vendor-supplied with hardware
MSS	MCI	Management Framework	OTS/DEV	Gnrc	HP OpenView Network Node Manager
MSS	MCI	Diagnostic Tests	OTS	Gnrc	vendor-supplied with hardware
MSS	MCI	Application Management	DEV	Gnrc	
MSS	MCI	Automatic Actions	DEV	Gnrc	
MSS	MCI	Resource Class Category	DEV	Gnrc	
MSS	MCI	Performance Manager	OTS/DEV	Gnrc	not chosen yet
MSS	MCI	Report Generation and Distribution	DEV	Gnrc	

Table 3.3.2-1. EDC Components Analysis (4 of 5)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
MSS	MCI	Performance Test	OTS	Gnrc	vendor-supplied with hardware
MSS	MCI	Performance Management Proxy	DEV	Gnrc	
MSS	MCI	Security Manager	DEV	Gnrc	
MSS	MCI	Security Databases	OTS	Gnrc	Operating System Password Files, DCE Registry Database, Router Configuration Files, TCP Wrappers configuration files, Operating System Access Control Lists, DCE Access Control Lists
MSS	MCI	Tests	OTS	Gnrc	CRACK, COPS, SATAN, TRIPWIRE
MSS	MCI	DCE Cell Management	OTS	Gnrc	HAL DCE Cell Manager
MSS	MCI	Security Management Proxy	DEV	Gnrc	
MSS	MCI	Accountability Manager	DEV	Gnrc	
MSS	MCI	User Profile Server	DEV	Gnrc	
MSS	MCI	Management Proxy	DEV	Gnrc	
MSS	MCI	Physical Configuration Manager	OTS	Gnrc	Mountain View
MSS	MCI	Network Manager	OTS	Gnrc	HP OpenView Network Node Manager
MSS	MCI	Physical Configuration Proxy Agent	DEV	Gnrc	
MSS	MCI	Trouble Ticketing Management Services	OTS	Gnrc	Remedy Action Request System
MSS	MCI	Trouble Ticketing User Interface	DEV	Gnrc	
MSS	MCI	Trouble Ticketing Service Requester	DEV	Gnrc	
MSS	MCI	Trouble Ticketing Proxy Agent	DEV	Gnrc	
MSS	MCI	Management Data Access Services	DEV	Gnrc	
MSS	MCI	Management Data Access User Interface	DEV	Gnrc	
MSS	MCI	Ground Events Planning	reuse	Gnrc	Reused from Planning Subsystem, PLANG CSCI, planning workbench CSC

Table 3.3.2-1. EDC Components Analysis (5 of 5)

Subsystem	CSCI	CSC	TYPE	USE	NOTES
MSS	MLCI	Baseline Manager	OTS/ DEV	Gnrc	Not chosen yet
MSS	MLCI	Software Change Manager	OTS/ DEV	Gnrc	ClearCase
MSS	MLCI	Change Request Manager	OTS/ DEV	Gnrc	Distributed Defect Tracking System
MSS	MACI	Extensible SNMP Master Agent	OTS/ DEV	Gnrc	Peer Network's agent, along with its toolkit for DEV
MSS	MACI	ECS Subagent	DEV	Gnrc	
MSS	MACI	DCE Proxy Agent	DEV	Gnrc	
MSS	MACI	Encapsulator for non-Peer Agent	OTS/ DEV	Gnrc	Non-Peer agents not chosen yet, thus encapsulation not chosen yet.
MSS	MACI	SNMP Manager's Deputy	DEV	Gnrc	
MSS	MACI	Instrumentation Class Library	DEV	Gnrc	
MSS	MACI	Application MIB	DEV	Gnrc	
Planning	PLANG	Production Request Editor	DEV	Gnrc	
Planning	PLANG	Subscription Editor	DEV	Gnrc	
Planning	PLANG	Subscription Manager	DEV	Gnrc	
Planning	PLANG	Planning Workbench	DEV	Gnrc	
Planning	PLANG	Planning Object Library	OTS	Gnrc	Delphi C++ class libraries
Planning	PLANG	PDPS DBMS	OTS	Gnrc	Sybase DBMS

Note: The Planning and Processing Subsystems are provided for testing, but not for full operational use.

3.4 DAAC Hardware and Network Design

This section provides an overview of the hardware configuration currently envisioned to support the Release A early AI&T and interface testing activity at EDC. Included below are details with respect to the Release A LANs (within Section 3.4.1), and the SDPS and remaining CSMS hardware (within Section 3.4.2). The LAN configuration discussion provides an overview diagram, Figure 3.4.1-1, which focuses on the LaRC configuration from the “networks” point of view. The remaining hardware discussions include an overview of the processing, server, workstation and associated peripherals with an overview diagram, Figure 3.4.2-1, providing details on sizes, quantities, classes and in most cases, vendor and model numbers.

Note that the recommended configurations are based on design analysis and/or prototyping analysis in progress. Some design analysis is still proceeding on the incremental development track which relies heavily on prototyping. As further prototyping and design analysis is performed, the ECS team will continue to provide cost/performance analysis that is expected to impact the

recommended configurations given in this document. Therefore, “selected” make and model numbers are still subject to change.

The following subsections provides details of the design *rationale* and recommended *configuration* for each of the CSMS and SDPS subsystems.

3.4.1 EDC DAAC LAN Configuration

The EDC DAAC LAN topology is illustrated in Figure 3.4.1-1. The topology changed slightly at EDC for Release A to add an Ingest server, but the network architecture will remain essentially as it was during the Ir1 release. Thus, Figure 3.4.1-1 reflects the network topology that will basically be in place at Release A. The topology consists of a single 10 Mbps Ethernet segment connected to an Ethernet hub, which connects to the current V0 network segment, to which the EBnet routers will also be connected. The interface to the Landsat Processing System (LPS) is currently TBD due to the impact of the EBnet consolidation. (Note, however, that LPS will be located at GSFC during much of Release A and will use the Internet for communications to the EDC DAAC for the purposes of early interface testing.)

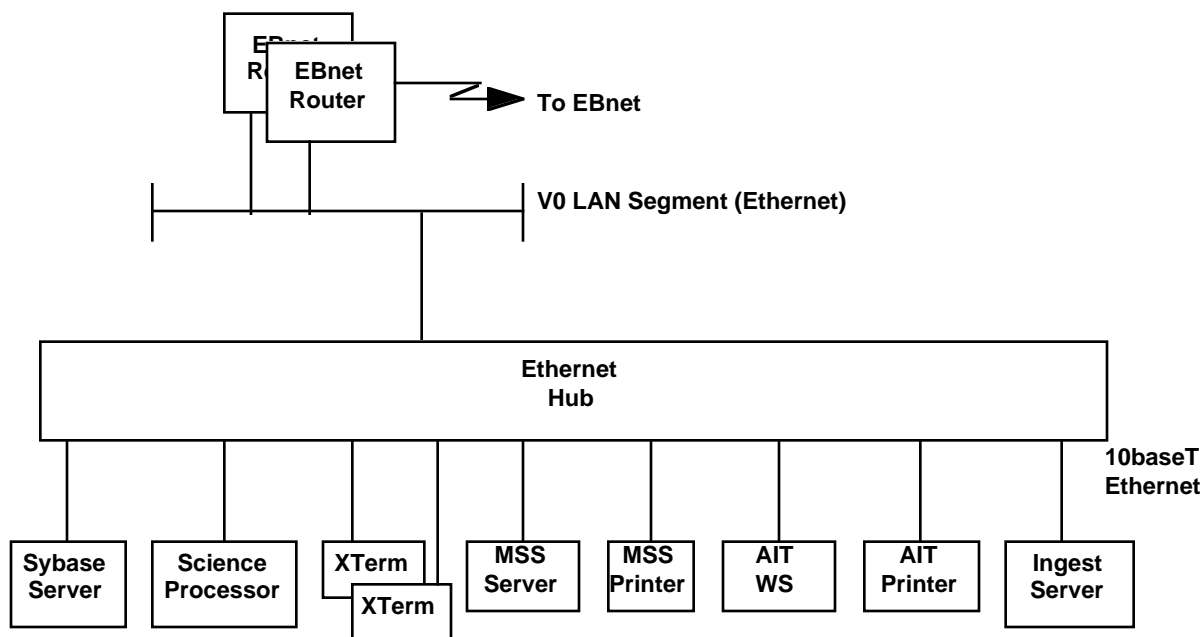


Figure 3.4.1-1. EDC DAAC LAN Topology

The quantities of networking hardware for the EDC DAAC subsystem are presented in Table 3.4.1-1. Note that this table reflects equipment that will be installed for the Ir1 release; no additional networking hardware will be needed for Release A.

Table 3.4.1-1. Networking Hardware for EDC DAAC LAN

Networking Component	DAAC Subsystem	Quantity	Comments
Ethernet Concentrator	All	1	All Ethernet 10baseT hub
Ethernet Cables	All	9	10baseT connection to printers

3.4.1.1 Sizing/Performance Rationale

The data flow estimates used as input to the design process for the EDC DAAC LAN topology are contained in Table 3.4.1.1-1. The table, based on both dynamic and static analysis performed by ECS, is arranged according to the source and sink of the flow. Note that since EDC is involved only in AI&T and early interface testing during Release A, the data rates are low.

The values contained in the table include all overhead and contingency factors. The “raw” numbers provided from the model were 24 hour averages. Factors for protocol overhead (25%, or a multiplier of 1.25) and circuit utilization (1.25) were applied, as was a factor of 1.5 to convert from the 24 hour averages to peaks. Note that the additional factors for AI&T and scheduling contingency, which were used for the other R-A DAACs, are not applicable for EDC, since EDC is involved only in interface testing and algorithm development.

Table 3.4.1.1-1. Estimated Release A Data Flows for the EDC DAAC

Flow Description	Data Flow Volume (in Mbps)
LPS Ingest Testing	< .10
Cumulative Integration and Test Flows	1.43
To/From Other DAACs	0.02
MSS to Other Hosts (includes LSM)	< 0.01

3.4.2 EDC Hardware Configuration

The EDC hardware configuration builds on the Ir1 supplied capacity and is designed explicitly to support early AI&T for ASTER and interface testing (e.g., Landsat-7). Given these requirements, only a subset of the subsystems have supplied components at the site: Data Processing (for AI&T science processing capacity), Ingest (for major interface testing), Management (MSS, for local site management) and minimal communications support (ISS).

The subsections which follow below provide a synopsis of the design process, and the resultant configuration for the EDC site for Release-A. Figure 3.4.2-1 below, provides an overview of the entire configuration and includes the core Ir1 configuration built upon by the Release-A required units (shaded components are added at Release A). Essentially, most of the configuration supplied at Ir1 remains intact without modification, except for the additional components added to the Ingest hardware.

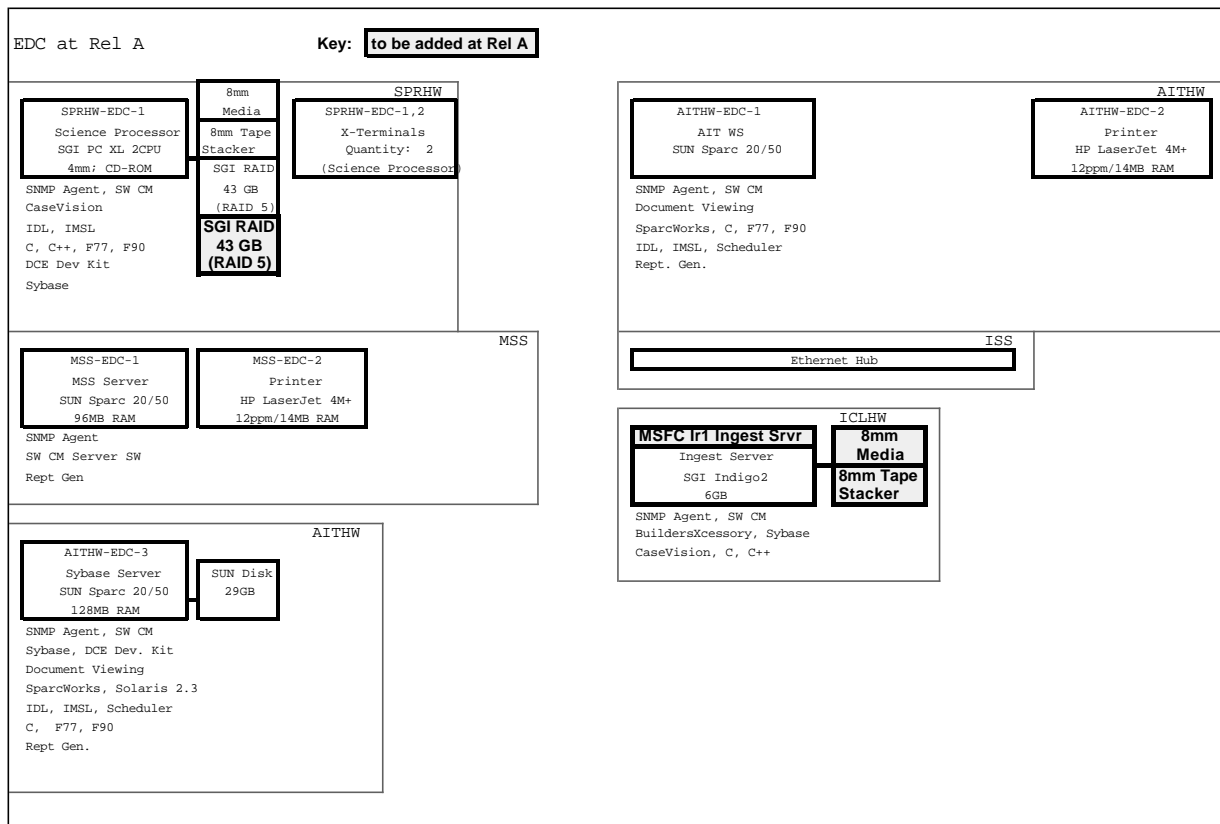


Figure 3.4.2-1. EDC DAAC Hardware Configuration Overview Diagram

3.4.2.1 Client Subsystem

There is no dedicated hardware support (HWCI) for the Client Subsystem. The Client software configurations are supported by: (1) non-ECS provided hardware platforms, in the case of Client software utilized by the user community, or (2) ECS provided workstations utilizing Client software in support of operations users (network management, DAAC operations, AI&T etc.).

3.4.2.2 Data Server Subsystem

Within the Release A time frame, there is no hardware support for this subsystem since there are no ECS archive operations within this time frame, only AI&T and interface testing support.

3.4.2.3 Data Management Subsystem

Within the Release A time frame, there is no hardware support for this subsystem since there are no ECS Data Management operations within this time frame, only AI&T and interface testing support.

3.4.2.4 Ingest Subsystem

Ingest subsystem hardware at EDC is responsible for support of early interface testing of the Landsat Processing System (LPS) interface in preparation for the Landsat-7 mission. Subsystem configuration and specific component sizing rationale are provided in the following paragraphs.

3.4.2.4.1 Rationale

The sizing of Ingest Subsystem hardware both from a system level and a component level is based on the 6/21/95 version of the ECS Technical Baseline. Among the information included in the baseline is:

- data by instrument,
- average daily data volume by level,
- and data destination.

Ingest client hosts are sized to support early interface testing, as well as I/O and CPU capabilities to support internal data transfers associated with simulated metadata validation and extraction and transfer of data to the Data Server Subsystem. Working storage disks are sized to accommodate the above functions. RMA is not a critical driver for the Ingest Subsystem at this site in Release A as there is no time-critical Level 0 data ingest at this time.

3.4.2.4.2 Configuration

The following configuration is supplied for EDC. See Figure 3.4.2-1 for an overview of the Ingest Subsystem within the site configuration.

3.4.2.4-4 Ingest HWCI Component Sizing for the EDC DAAC Configuration

Ingest Component	Component Class	Quantity	Comments
Client Host (ICLHW)	SGI Indigo 2	1	L0 Ingest Client host. Hosts are adapted to ECOM I/F (FDDI for Release-A) and ESN. Host attached disk. SCSI I/F to working storage.
(Working Storage)	Magnetic Disk (host attached)	1 (6 GB)	Host adapted magnetic disk. SCSI / SCSI II
Client Host (ICLHW)	8 mm tape stacker	1	Support for Version 0 ingest
Client Host (ICLHW)	X-Terminal	1	OPS support for Data Ingest Technician(s).

3.4.2.5 Interoperability Subsystem

Within the Release A time frame, there is no hardware support for this subsystem since there are no ECS operations within this time frame, only AI&T and interface testing support.

3.4.2.6 Production Planning Subsystem

Within the Release A time frame, there is no hardware support for this subsystem since there are no ECS production operations within this time frame, only AI&T and interface testing support.

3.4.2.7 Data Processing Subsystem

The Data Processing Subsystem (DPS) consists of three hardware CIs:

- (1) *Science Processing*—the primary HWCI in the Processing Subsystem and contains staging (working storage), input/output (I/O), and processing resources necessary to perform routine processing, subsequent reprocessing, and Algorithm Integration & Test (AI&T). SPRHW HWCI consists of two components: Science Processing which provides a pool of cluster configured processing resources, and Processing Queue Management which provides the workstation(s) required to manage, control and status tasked dispatched to the processing resources. Since there are no true production operations at EDC during the Release A time frame, this HWCI provides only the science processing capacity to host science software in early AI&T. The queuing component, which is normally the secondary (backup) server for the Planning Server (PLNHW HWCI), is not supplied at Release A. See the AITHW HWCI for more details.
- (2) *Quality Assessment and Monitoring (AQAHW)*—This HWCI contains the hardware necessary to support DAAC operations users performing planned routine QA of product data. At a minimum, the hardware can be configured for general user and subscription use (client support). This HWCI may, over time, consist of QA monitors and workstations ranging from X-terminals, to small user workstations, to medium or large graphics workstations. The complement is site dependent and is a function of the classes of production performed. The need for visualization support will be explored as product specific QA processes and requirements are worked jointly with the DAAC operations personnel as well as the science teams. Since there are no true production operations at EDC during the Release A time frame, this HWCI is not provided as part of the Data Processing capability.
- (3) *Algorithm Integration and Testing (AITHW)*—This HWCI provides the hardware resources to support DAAC operations users performing: science software algorithm integration and test, systems validation and integration and test. This HWCI provides the workstation and server based operations support hardware, while the prime science software integration and test capacity is provided within the SPRHW HWCI (i.e., no science processors are provided by the AITHW CI to the DAAC configuration). The AITHW HWCI provides the operations support workstations to allow DAAC personnel to configure, control and manage the AI&T processes engaged on the target science processes. AITHW also has provision for a small dedicated DBMS server to support AI&T, which does not interfere with the operational environment

DPS is responsible for managing, queuing, and executing processes on a specified set of processing resources at each DAAC site, and operates in conjunction with the Planning Subsystem.

The overall hardware design for ECS is that of a heterogeneous computing environment. The configuration highlighted here is specifically for Release A (including components provided at IR1), but factors in requirements with a “look ahead” to Release B for platform suitability, scalability and evolvability. The candidate hardware is tailored to DAAC unique instrument processing needs.

3.4.2.7.1 Data Processing Rationale

The purpose of the system level performance and capacity analysis is to provide a basis for sizing for Processing, Data Server and Ingest Subsystem capacity as a system. The subsystems are viewed as parts of an integrated system as static and dynamic analysis are applied to generate recommended configurations.

The rationale supplied here addresses SPRHW and AITHW. The sizing for SPRHW focuses heavily on science processor MFLOPs, I/O, communications and host attached disk requirements to support AI&T capacity. Rationale for the configuration recommendations are provided below.

WITH RESPECT TO THE SPRHW HWCI: The primary focus at Release A for EDC is to support early algorithm integration and test operations for ASTER. No full-up production operations are supported during this time frame. The hardware provided at EDC to support AI&T processing and interface testing is carried over from Ir1. This AI&T sizing is based on Ir1 sizing agreements as well as the processing phasing requirements applied to Release B performance and capacity. Migration to Release B, platform suitability and scalability are applied in the analysis.

The following major driving requirements govern the sizing rationale for the processing hardware:

- RMA requirements, (assumed only applicable to Release B analysis)
- capacity phasing (discussed below in detail),
- January 1995 ECS Technical Baseline, incorporating AHWGP estimates
- Hardware suitability (software support, mission support) and scalability
- Parallel AI&T and production operations (at the operational sites)

Release A performance and capacity analysis is based upon the January 1995 Technical Baseline/AHWGP data for this CDR analysis. New AHWGP data has been supplied in June 1995 primarily affecting MODIS at GSFC and to a lesser extent CERES and MISR at LaRC. Although this data is being analyzed by the modeling and science team, it has not been applied to the CDR design and analysis described in this volume.

Capacity phasing rules, which are part of the ECS Technical Baseline, are applied to the calculated capacities to produce the required capacities for the project phase in question. A subset of the capacity phasing rules apply to the SPRHW HWCI configuration for EDC since it is sized for the period extending into the one year before AM-1 launch.

The following bullets describe the required phasing factors and how they are applied to processing capacity based on launch dates:

- **0.3X for $L-2 < t < L-1$** For pre-launch AI&T starting at launch minus 2 years, AI&T requires 0.3 of the processing estimate at launch during the period 1 to 2 years prior to launch. X is defined as at-launch processing estimate for pre-launch AI&T.
- **1.2X for $L-1 < t < L+1$** For pre-launch AI&T and system I&T, starting at launch minus 1 year, AI&T and system I&T requires 1.2 times the processing estimate at launch during the year prior to launch. Standard instrument processing requirements begin from launch date and last for the remainder of the life of the instrument. X is defined as at-launch processing estimate for prelaunch AI&T and systems I&T.

Spreadsheet analysis (or static analysis) was used to generate the processing capacities for EDC AI&T support, based on the AHWGP data roll-up summaries. Performance and data volume demands were summarized and translated into average processing (MFLOPs), input/output, (I/O) and network bandwidth requirements.

Spreadsheet analysis (or static analysis) results are initially presented for Release A (Epoch e) and Release B (Epoch k) sites. Performance and data volume demands are summarized and translated into average processing (MFLOPs), input/output, (I/O) and network bandwidth requirements. The spreadsheet results are time-averaged over the daily operations period.

WITH RESPECT TO THE AQAHW HWCI: The Algorithm Quality Assurance HWCI (AQAHW) contains hardware resources to support DAAC operations users performing planned routine QA of product data. This HWCI facilitates the performance of “DAAC based” QA. While the actual processing resources are included within the SPRHW, this HWCI provides the basic facilities to control and enable QA as a process within each DAAC facility (as needed per site specific science and operational policies). Since there are no operational processing requirements at EDC at Release-A, this HWCI does not contribute to the site complement until Release B. Equivalent functions, for AI&T, are supported by the AITHW HWCI (discussed below).

WITH RESPECT TO THE AITHW HWCI: The Algorithm Integration & Test HWCI (AITHW) provides essentially the same configuration at Release-A that was provided at Ir1. Operations workstations and a small server are provided to support the AI&T activity, which utilizes AI&T capacity provided by the SPRHW Science Processors to actually host and test the science algorithm software applications. Thus, the AITHW HWCI just provides the operations support workstations to allow DAAC personnel to configure, control and manage the AI&T processes engaged on the target science processors.

The design rationale supplied for the Ir1 components applies, and is not repeated in this volume. AI&T requirements, which increase at Release-A for configurations that were supplied at Ir1, affect the SPRHW hardware CI, not the core of the operations support hardware which is supplied within AITHW. Briefly, the AITHW, sized to support Ir1 and Release A activities, is based on supporting the following:

- Within the AI&T operations workstation:
 - Management and control of AI&T,
 - Compiler suite support, and
 - Report generation.

- Within the AI&T server:
 - Sybase DBMS support (tracking execution profiles, tool kits, data files, etc.),
 - Compiler suite support, and
 - Planning & Queuing test configuration support.

See the site specific design rationale discussion provided earlier within this section for AI&T science processing capacity information as well as the supplied configuration discussed in the section that follows.

3.4.2.7.2 Processing Configuration

The specific provided configurations for the Release A EDC SPRHW and AITHW HWCIs, as derived from the rationale described above, is synopsized below. Figure 3.4.2-1 provides the full details for the site's configuration, include layouts for the appropriate HWCIs. Additional details on specific component configurations and sizing are provided within the figures (including make and model numbers assumed as candidates for implementation).

Table 3.4.2.7-5 summarizes the *required* capacities vs. the recommended data processing platform's *provided* capacities within the recommended configuration. The AHWGP required capacities are derived from the sizing efforts briefly outlined in 3.4.2.7.1 above. Required capacities were modified given the assumptions discussed in the table notes included below.

Table 3.4.2.7-5. Provided Processing Capacity for the EDC Science Processing Configuration

DAAC	Rel	AHWGP Required Capacity			Provided Capacity			
		MFLOPs	Bandwidth	Disk Volume	Platform	Peak MFLOPs	Peak I/O Bandwidth	Disk Volume
EDC	Ir1 Rel A	120 +57	25 MB/sec +156 MB/sec	35 GB +35 GB	SMP (2 CPU) No Change	600 No Change	320 MB/sec No Change	35 GB +35 GB

(1) ESDIS phasing factors and machine efficiencies are applied.

(2) EDC disk volume estimate based on instrument team input.

(3) AI&T environment at EDC.

(4) "AHWGP provided capacity" and "provided capacity" based on static analysis for this site.

The recommended platform for EDC is a high-end SMP (SMP-H) configuration to support MODIS and ASTER for Ir1/Release-A. EDC supports AI&T in Release A and, therefore, does not require a backup processor for the Planning function (e.g., Process Queuing Server).

Sizing of SPRHW CIs are derived from static (or spreadsheet) analysis of the Technical Baseline. Peak values have been estimated. This sizing was performed in order to estimate processing, I/O

and disk needs. More precise estimates of dynamic peak CPU processing performance, I/O bandwidth, and staging values will be determined by system modeling results and applied as soon as they are available for EDC Release B (MODIS).

Total EDC processing requirements are 177 MFLOPs for Release A. The processing at EDC is split between the ASTER and MODIS instruments. Considering the scalability, the EDC processor platform is sized from a minimum SMP-H (e.g., 2 CPUs) for Ir1 to a 10 CPU configuration to support the end of contract requirement of 3 GFLOPs. Given this static analysis, the provided configuration for SPRHW is only augmented in the disk area (phasing applied to epoch k to derived epoch e needs), as shown above. The core science processor configuration (Ir1) is still deemed to be adequate given the phasing of epoch k processing and I/O needs. The base Ir1 configuration of system RAM, sized at Ir1 at 256MB, is not modified. (Continued work with the science and algorithm development teams may modify the RAM requirement).

AQAHW There are no DAAC based QA workstations supplied at EDC for Release-A since there are no processing clusters supporting actual operations in this time frame. Any “QA” processing on data produced by science processes under early AI&T are analyzed through mechanisms at the SCF as well as the GSFC compliment of AITHW supplied workstations and server (discussed below).

AITHW The EDC requirement for an AI&T server and OPS workstation doesn’t change given that the SPRHW provides the science processing capacity. The Ir1 configuration supplied prior to Release-A remains in place and is not augmented further.

3.4.2.8 Communications and Management Subsystems (CSS / MSS)

At EDC, no additional hardware will be added to support Release A. A Sun 20/50 workstation will be provided for Ir1 use of Clearcase. ECS hosts at EDC will contain DCE client software, but since EDC is not operational at Release A, it will use the DCE directory and security servers at the SMC. This is not expected to be a performance issue, since the DCE client cache is large enough so that server references will occur primarily at system start-up.

3.5 Software/Hardware Mapping

Table 3.5-1 provides a mapping of EDC Release A software components to hardware. See the note at the bottom of the table for mapping of HWCI units to the numbers identified in the table.

Table 3.5-1. EDC Software to Hardware Analysis (1 of 4)

Subsystem	CSCI	CSC	HWCI /units	NOTES
Client	DESKT	Desktop	5,7,9,12,22,23,26	
Client	WKBCH	Hypertext Viewer CSC	5,7,9,12,22,23,26	
Client	WKBCH	Data Visualization (EOSView) CSC	5,7,12,22,23	
Client	WKBCH	SDPS Toolkit CSC	none	
Client	WKBCH	CSMS Toolkit CSC	none	

Table 3.5-1. EDC Software to Hardware Analysis (2 of 4)

Subsystem	CSCI	CSC	HWCI /units	NOTES
Client	WKBCH	Release A Client	none	
CSS	DCCI	File Access Services	29	
CSS	DCCI	Message Passing Services	29	
CSS	DCCI	Time Services	29	
CSS	DCCI	Event Logger Services	29	
CSS	DCCI	Electronic Mail Services	29	
CSS	DCCI	Thread Services	29	
CSS	DCCI	Directory/Naming Services	28	
CSS	DCCI	Life Cycle Services	29	
CSS	DCCI	Security Services	28	
CSS	DCCI	DOF Services	28	
CSS	DCCI	Virtual Terminal Services	28	
Data Processing	AITTL	Documentation Viewing Tools	4, 5	
Data Processing	AITTL	Standards Checkers	4, 1	
Data Processing	AITTL	Code Analysis Tools	4, 1	
Data Processing	AITTL	Data Visualization Tools	4, 5	
Data Processing	AITTL	ECS HDF Visualization Tools	4, 5	
Data Processing	AITTL	HDF File Comparison Utility	4, 1	
Data Processing	AITTL	Binary File Comparison Utility	4, 1	
Data Processing	AITTL	Profiling Tools	4, 1	
Data Processing	AITTL	PGE Processing GUI	5	
Data Processing	AITTL	PGE Registration GUI	5	
Data Processing	AITTL	Report Generation Tools	4	
Data Processing	AITTL	SDP Toolkit-related Tools	5	
Data Processing	AITTL	Product Metadata Display Tool	5	
Data Processing	PRONG	Resource Management	2,8(backup), 1	
Data Processing	PRONG	COTS	4 or 5	
Data Processing	PRONG	COTS Management	4 or 5	
Data Processing	PRONG	Data Management	4 or 5	
Data Processing	PRONG	Data Pre-Processing	1	
Data Processing	PRONG	PGE Execution Management	2,8(backup), 1	
Data Processing	PRONG	Quality Assurance Monitor	7 (if configured)	
Data Processing	SDPTK	Ancillary Data Access	1, 4	
Data Processing	SDPTK	Celestial Body Position	1, 4	
Data Processing	SDPTK	Coordinate System Conversion	1, 4	
Data Processing	SDPTK	Constant and Unit Conversions	1, 4	
Data Processing	SDPTK	Ephemeris Data Access	1, 4	

Table 3.5-1. EDC Software to Hardware Analysis (3 of 4)

Subsystem	CSCI	CSC	HWCI /units	NOTES
Data Processing	SDPTK	Geo Coordinate Transformation	1, 4	
Data Processing	SDPTK	Input/Output	1, 4	
Data Processing	SDPTK	Memory Management	1, 4	
Data Processing	SDPTK	Metadata Access	1, 4	
Data Processing	SDPTK	Process Control	1, 4	
Data Processing	SDPTK	Status Message File (Error/Status)	1, 4	
Data Processing	SDPTK	Time Date Conversion	1, 4	
Data Processing	SDPTK	Math Package	1, 4	
Data Processing	SDPTK	Graphics Library	1, 4	
Data Processing	SDPTK	EOS-HDF	1, 4	
Ingest	INGST	Ingest Session Manager	10	
Ingest	INGST	Polling Ingest Client Interface	10	
Ingest	INGST	Ingest Request Processing	10	
Ingest	INGST	Ingest Data Transfer	10	
Ingest	INGST	Operator Ingest Interface	11	(X-term access)
Ingest	INGST	User Network Ingest Interface	30	
Ingest	INGST	Ingest DBMS	10	
Ingest	INGST	Ingest Administration Data	11	
Ingest	INGST	Peripheral Software	10	
Ingest	INGST	Viewing Tools	11	
Ingest	INGST	Client Services	10	
ISS	INCI	Datalink/Physical		
MSS	MCI	Management Framework	26 or 27	
MSS	MCI	Diagnostic Tests	26 or 27	
MSS	MCI	Application Management	26 or 27	
MSS	MCI	Automatic Actions	26 or 27	
MSS	MCI	Resource Class Category	26 or 27	
MSS	MCI	Performance Manager	27,28	
MSS	MCI	Report Generation and Distribution	27,28	
MSS	MCI	Performance Test	26 or 27	
MSS	MCI	Performance Management Proxy	26 or 27	
MSS	MCI	Security Manager	26 or 27	
MSS	MCI	Security Databases	26 or 27	
MSS	MCI	Tests	26 or 27	
MSS	MCI	DCE Cell Management	26 or 27	
MSS	MCI	Security Management Proxy	26 or 27	

Table 3.5-1. EDC Software to Hardware Analysis (4 of 4)

Subsystem	CSCI	CSC	HWCI /units	NOTES
MSS	MCI	Accountability Manager	27,28	
MSS	MCI	User Profile Server	26 or 27	
MSS	MCI	Management Proxy	26 or 27	
MSS	MCI	Physical Configuration Manager	27, 28	
MSS	MCI	Network Manager	27, 28	
MSS	MCI	Physical Configuration Proxy Agent	27, 28	
MSS	MCI	Trouble Ticketing Management Services	27,28	
MSS	MCI	Trouble Ticketing User Interface	27,28	
MSS	MCI	Trouble Ticketing Service Requester	26 or 27	
MSS	MCI	Trouble Ticketing Proxy Agent	27,28	
MSS	MCI	Management Data Access Services	26 or 27	
MSS	MCI	Management Data Access User Interface	26 or 27	
MSS	MCI	Ground Events Planning	26 or 27	
MSS	MLCI	Baseline Manager	26 or 27	
MSS	MLCI	Software Change Manager	26 or 27	
MSS	MLCI	Change Request Manager	26 or 27	
MSS	MACI	Extensible SNMP Master Agent	26 or 27	
MSS	MACI	ECS Subagent		
MSS	MACI	DCE Proxy Agent		
MSS	MACI	Encapsulator for non-Peer Agent		
MSS	MACI	SNMP Manager's Deputy		
MSS	MACI	Instrumentation Class Library		
MSS	MACI	Application MIB		
Planning	PLANG	Production Request Editor	2,8	
Planning	PLANG	Subscription Editor	2,8	
Planning	PLANG	Subscription Manager	2,8	
Planning	PLANG	Planning Workbench	2,8	
Planning	PLANG	Planning Object Library	2,8	

Note: Units mapping

1== SPRHW/science processors

2==SPRHW/queuing management server

4==AITHW/AI&T DBMS server

5==AITHW/AI&T Operations workstations

7==AQAHW/QA workstations

8==PLNHW/planning server

9==PLNHW/planning workstations

10==ICLHW/ingest server

11==ICLHW/ingest workstation
12==ACMHW/administration and operations workstations
13==ACMHW/APC servers
14==DIPHW/distribution servers
17==DRPHW/FSMS servers
18==DRPHW/archive robotics
19==DRPHW/DBMS servers
20==DRPHW/document server
22==DMGHW/data specialist workstations
23==DMGHW/administration and operations workstations
24==DMGHW/DBMS servers
26==MSS/MSS workstations
27==MSS/MSS Local System Management server
28==CSS/CSS server
29== all workstations and hosts
30== User workstation

4. Future Releases

This document has described the element of ECS subsystems applicable to the EDC DAAC at Release A of ECS. Three other releases are currently planned. The next release, Release B is scheduled for September 1997. There will be a significant increase in functionality with Release B, as identified in the Release Plan Content Description document. The impact of this functionality on the EDC DAAC will be considerable. Release B will be the first to bring together all DAACs as well as providing full functionality to ingest, archive, produce products, and disseminate products.

An updated version of this document will precede Release B and will reflect the design corresponding to that release. In particular, items which will be reflected include:

- Incorporation of EDC V0-DAAC data sets as a function of the data migration process, as well as a function of the addition of new instruments
- Standard product generation performed at the EDC DAAC
- Remapping of software to hardware components
- Additional interfaces (full active interfaces to Landsat-7 PS & IAS, ASTER and MODIS)
- Incorporation of a multi-tiered storage configuration

In addition to impacts caused by the addition of ECS capabilities, this document will also change to reflect how certain DAAC issues are addressed and/or resolved. These issues include

- Identification of DAAC unique requirements
- Level of data set migration from V0 to ECS including the extent to which living V0 production systems migrating over to ECS resources
- The DAACs interface to GCDIS and UserDIS.

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Abbreviations and Acronyms

ACMHW	Access Control and Management HWCI
ADC	Affiliated Data Center
ADS	Archive data sets
ADSHW	Advertising Service HWCI
ADSRV	Advertising Service CSCI
AITHW	Algorithm Integration & Test HWCI
AITTL	Algorithm Integration and Test Tools (CSCI)
AM	Ante meridian
ANSI	American National Standards Institute
APC	Access/Process Coordinators
API	Application Programming Interface
AQAHW	Algorithm QA HWCI
ASAP	As soon as possible
ASCII	American Standard Code for Information Interchange
ASF	Alaska SAR Facility (DAAC)
ATM	Asynchronous Transfer Mode
CD ROM	Compact disk read only memory
CDRL	Contract Data Requirements List
CERES	Clouds and Earth's Radiant Energy System
CI	Configuration Item
CIESIN	Consortium for International Earth Science Information Network
CLS	Client Subsystem
COTS	Commercial off-the-shelf
CPU	Central processing unit
CSC	Computer Software Component
CSCI	Computer Software Configuration Item
CCSDS	Consultative Committee for Space Data Systems
CM	Configuration Management

CSDT	Computer Science Data Types
CSMS	Communications and Systems Management Segment
CSS	Communication Subsystem (CSMS)
DAA	DAN Acknowledge
DAAC	Distributed Active Archive Center
DADS	Data Archive and Distribution System
DAN	Data Availability Notice
DAO	Data Assimilation Office
DAR	Data Acquisition Request
DAS	Data Availability Schedule
DBA	Database administrator
DBMS	Database Management System
DDA	Data Delivery Acknowledgment
DDICT	Data Dictionary CSCI
DDIST	Data Distribution CSCI
DDN	Data Delivery Notice
DDSRV	Document Data Server CSCI
DESKT	Desktop CI
DEV	Developed code
DID	Data Item Description
DIM	Distributed Information Manager
DIMGR	Distributed Information Management CSCI
DIPHW	Distribution & Ingest Peripheral Management HWCI
DMGHW	Data Management HWCI
DMS	Data Management System
DMS	Data Management Subsystem
DP	Data Processing
DPREP	Science Data Pre-Processing CSCI
DPS	Data Processing Subsystem
DR	Data Repository
DRPHW	Data Repository HWCI

DS	Data Server
DSM	Distribution Storage Management
DSS	Data Server Subsystem
DT	Data Type
ECS	EOSDIS Core System
EDC	EROS Data Center (LPDAAC)
EDOS	EOS Data and Operations System
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESDIS	Earth Science Data and Information System
ESDT	Earth Science Data Types
F&PRS	Functional and Performance Requirements Specification
FC	Fiber Channel
FDDI	Fiber distributed data interface
FDF	Flight Dynamics Facility
FOS	Flight Operations Segment
FSMS	File and Storage Management System
Ftp	File transfer protocol
GB	Gigabyte
GDAO	GSFC Data Assimilation Office
GFLOPS	Giga (billions) Floating Point Operations per Second
GSFC	Goddard Space Flight Center
GTWAY	Version 0 Interoperability Gateway CSCI
HDF	Hierarchical Data Format
HTML	Hypertext Markup Language
HWCI	Hardware Configuration Item
I&T	Integration and Test
I/O	Input/Output
IAS	Image Assessment system (Landsat-7)
ICD	Interface Control Document
ICLHW	Ingest Client HWCI

IDL	Interface Definition Language
IGS	International Ground System (Landsat-7)
IP	International Partner
Ir1	Interim Release 1
IRD	Interface Requirements Document
IS	Ingest Subsystem
JPL	Jet Propulsion Laboratories
LaRC	Langley Research Center
LIM	Local Information Manager
LIMGR	Local Information Management CSCI
LIS	Lightning Imaging Sensor
L0	Level 0
LPS	Landsat Processing System
MB	Megabyte
Mbps	Megabits per second
MBps	Megabytes per second
MOC	Mission Operations Center
MODIS	Moderate-Resolution Imaging Spectrometer
MSFC	Marshall Space Flight Center
MSS	Management Subsystem (CSMS)
NOAA	National Oceanic and Atmospheric Administration
NSIDC	National Snow and Ice Data Center (DAAC)
ODC	Other Data Center
ODL	Object Description Language
ORNL	Oak Ridge National Laboratory (DAAC)
OTS	Off-the-shelf
PDPS	Planning and Data Processing System
PDR	Preliminary Design Review
PDS	Production Data Set
PGE	Product Generation Executive
PGS	Product Generation System

PLNHW	Planning HWCI
PRONG	Processing CSCI
PS	Processing System (Landsat-7)
Q/A	Quality Assurance
QA	Quality Assurance
RAID	Redundant Array of Inexpensive Disks
RAM	Random Access Memory
REL	Release
RID	Review Item Discrepancy
S/C	Spacecraft
SCF	Science Computing Facility
SDP	Science Data Processing
SDPS	Science Data Processing Segment
SDPS/W	Science Data Processing Software
SDPTK	SDP Toolkit CSCI
SDSRV	Science Data Server CSCI
SFDU	Standard Format Data Unit
SMC	System Management Center
SPRHW	Science Processing HWCI
STMGT	Storage Management CSCI
TBD	To be determined
TBR	To be resolved
TRMM	Tropical Rainfall Measuring Mission
V0	Version 0
WAN	Wide Area Network
WKBCH	Workbench CI
WKSHC	Working Storage HWCI